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come from the storage device 108 attached to the host system 104. In an exemplary embodiment, the data required for an automated independent technical review is identified and subsequently gathered into a single, relational database stored on a storage device 108 connected to the host system 104. The item description code data 114 includes a list of valid materials that can be measured. The counter data 116 includes the assay results or measurement data taken by a counter for a particular radioactive waste container. The isotopic measurement data 118 are either data collected using an isotopic measurement system or default regulatory values if no measurement data are available. The regulatory data 120 includes limits set by the government. This automated independent technical review data can be gathered from locations around the world and then consolidated into a single database stored on a storage device 108 connected to the host system 104. Regulatory data 120, for example, may come from a variety of locations. The automated independent technical review data is gathered in response to a user system 102 request.

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[0016] (Amended) In an exemplary embodiment of the present invention, the host system 104 contains a suite of application programs that create an automated technical review report. The application programs and a software template are used to create a report that contains assay results, comparison results, and other data regarding a particular radioactive waste container. The comparison results are created using predetermined parameters and data values that can include values stored in data files, values or assay results created by a counter system, and data values calculated by application programs. A comparison test can have three possible results: (1) "assay acceptable" okay to ship the radioactive waste container; (2) "expert review required" before shipping; or (3) "reject" the test results because the data is faulty. If all tests results for a particular container are assay acceptable, then the final disposition on the report will indicate that the assay review is acceptable. If any test result is "expert review required", an independent technical review comment sheet will be generated

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and the final disposition will indicate that the expert review is required. Expert review is defined as a recommendation for human intervention before shipping the radioactive waste container. A person is advised to review the test results and make a determination of the status of the radioactive waste container if the test result is "expert review required." If any test result indicates a reject, the final disposition will be to reject the assay. If the disposition is reject, generation of an expert technical review comment sheet will be suppressed.

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[0018] (Amended) Another application program, in an exemplary embodiment, takes data from an isotopic measurement system and calculates the ratios of Pu^{239} and Pu^{240} . Based on the results of the comparison, the test data is flagged as "assay acceptable" or as "expert review required." The review sheet will print whether the measured isotopics or the default isotopics are being used based on whether the relative error for the Pu^{240} is greater than a selected limit, e.g., 70 %. If this condition exists or if no measured isotopics results are available then the report will display that default isotopics are used. In an exemplary embodiment of this application, a weapons grade plutonium test is applied when the default isotopics are not used. In this test, the absolute 3-sigma error for Pu^{240} is calculated. The 3-sigma error is added to and subtracted from the measured weight percent for Pu^{240} to produce a range. If the accepted weapons grade weight percent falls within this range, the result is "assay acceptable." If it falls outside of this range the test result is "expert review required."

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[0019] (Amended) In an exemplary embodiment of the present invention, another application on the host system 104 performs comparison of assay result container density data in order to determine if it is within a predetermined parameter. In an exemplary embodiment, the weight and fill height of a radioactive waste

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container is used to calculate the radioactive waste container density. If the density is above about 2.5 grams per cubic centimeter or below a selected lower limit, the measurement will be deemed not valid and the result "expert review required" will be generated. Otherwise, the result will be "assay acceptable." In an exemplary embodiment, another comparison involves checking for lumps of plutonium in the radioactive waste container because lumps can cause errors in the measurement. This method involves comparison of the Pu mass value calculated from the 129.29 kilo-electron volt ("keV") energy region and the 413.71 keV energy region. If the ratio of the 413.71 keV mass divided by the 129.29 kV mass exceeds the predetermined parameter of about 2.5, then the test result is "expert review required." Otherwise the test result is "assay acceptable."

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[0021] (Amended) Additionally, the host system 104 application, in an exemplary embodiment, performs comparisons on nuclide mass totals to ensure that they are within certain limits. The first part of the application calculates the mass ratio of a first isotope Pu^{239} to a second isotope Am^{241} . The nuclide mass totals results are used to compare the mass of the Pu^{239} to the mass of Am^{241} . If the ratio of the Pu^{239} mass to the Am^{241} mass is less than about 200, the result will be "expert review required", otherwise the result is "assay acceptable." The next part of the application analyzes the Pu^{239} mass to Np^{237} mass ratio. The nuclide totals results are used to compare the ratio of the Pu^{239} mass to Np^{237} mass. If the ratio of the Pu^{239} mass to Np^{237} mass is less than about 125, "expert review required" will be the result, otherwise the result is "assay acceptable." In addition, the application program, in an exemplary embodiment, performs additional isotope identification. The nuclide totals results for Np^{237} , U^{233} , U^{235} , and U^{238} are reviewed to identify potentially unidentified nuclides. The main energy lines used to identify these isotopes are listed in the table below.

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Isotope	Peak Energy Used
Np ²³⁷	311.90 keV
U ²³³	135.30 keV
U ²³⁵	185.72 keV
U ²³⁸	1001.03 keV

If the value of the count rate for any of these isotopes is greater than about 5 times the error, then the test result is "expert review required", otherwise the result is "assay acceptable". If the results of the isotopic measurement data confirms the presence of Np²³⁷, the Np²³⁷ nuclide totals result test is not performed. If the results of the isotopic measurement data confirms the presence of U²³⁵, the U²³⁵ nuclide totals result test is not performed.

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[0022] (Amended) In an exemplary embodiment of the present invention, an application on the host 104 performs a review of segment information in an effort to determine if measurements of individual segments of the drum are valid. Each segment is reviewed for transmission source results. The transmission source peaks with an energy less than about 400 keV are considered the low energy peaks. If the 400 keV transmission source peak intensity is less than about 1 percent of the calibrated intensity, the test result is "expert review required." If a low energy transmission source peak intensity other than the 400 keV peak is less than or equal to about 0.1 percent of its calibrated intensity, the result is "expert review required." Calibrated intensity means the intensity that the peak was at during the transmission calibration.

Another part of the application program looks at pulser/reference source results. These results help determine if the count rates are too high for accurate mass results. Two possible methods are used. Both are outlined here. The first method described uses a reference pulser. This pulser is set at a pre-determined energy and

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count rate during calibration. During an assay, this energy is checked to find the pulser peak. If the pulser peak is not found, the result will be "expert review required." If the peak is found but the total number of counts in the peak is less than a preset fraction of the initial count rate, "expert review required" will be the result. The second method uses a reference source. This method uses a radioactive source that has a known reference source peak energy. This reference energy peak is searched for and if the source peak is not found, "expert review required" will be the result. If the peak is found, "expert review required" will be the result if the total counts in the source peak is less than about 50% of the calibrated rate. Calibrated rate means the count rate of the source or reference peak determined at the time that the calibration was performed.

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[0023] (Amended) Still another portion of the application program that reviews segment information is the live time results. Real time is defined as live time plus dead time. Live time is the time during an assay that the detector is available to process counts. Dead time is the time during which the detector electronics are processing a count and are unavailable to collect counts. The live time results are checked for each segment. If the value of live time divided by real time is less than about 0.3, then "expert review required" will be the result. In an exemplary embodiment, the localized concentrations are also analyzed by this application program. This involves looking at the concentration in the bottom of the radioactive waste container. If the concentration is too high then the result is "expert review required." The bottom two segments are reviewed, and if the total activity, based on the 413.71 keV peak area, in the bottom two segments is greater than about 50% of the total activity in the radioactive waste container, then the result is "expert review required." A segment is an imaginary horizontal disc of the radioactive waste container seen by the detector. In an exemplary embodiment, a segment is between one half an inch and two inches in height.

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A9 [0027] The review template also includes a section for describing the tests that were performed 306. The review template in FIG. 3 has some examples of tests that could be performed. Any of the tests described earlier in reference to FIG. 1 could be listed in this section 306. These tests include determining whether an assay result is within a predetermined parameter. Along with a list of the test performed 306, the review template includes a section for the results 308 of the tests. As discussed in reference to FIG. 1 the results could be "assay acceptable", "expert review required", or "reject." Next, the review template contains a space for the final disposition 310 of the test. If all tests for the radioactive waste container are "assay acceptable", then the final disposition 310 will indicate the assay review is acceptable. If any test result is "expert review required", an expert technical review comment sheet, as shown in FIG. 4, will be generated and the final disposition 310 will indicate that technical review is required. If the final disposition 310 is "reject", generation of an expert technical review comment sheet will be suppressed. In an exemplary embodiment the review template also includes a place for the expert technical reviewer to sign 312 and date 314 the report.

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Cmt [0028] (Amended) FIG. 4 depicts an exemplary expert technical review comment template. The comment template contains a header 402 with the report title, "expert technical review comment sheet." Next, the comment template contains information 404 that identifies the particular data being tested and referred to in the report. In an exemplary embodiment, this information is the same as the data described above in reference to 304 in FIG. 3. Next, the comment template contains a space to describe the data requiring review 406. This section 406 will contain a list of the tests that resulted in the rating "expert review required." Section 408 of the comment template contains space for comments and disposition information. In an